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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/529,896	12/27/2005	Masanori Sakai	1592-0201PUS1	2272

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EXAMINER	
CHANDRA, SATISH	

ART UNIT	PAPER NUMBER
1716	

NOTIFICATION DATE	DELIVERY MODE
08/20/2010	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mailroom@bskb.com

Office Action Summary	Application No.	Applicant(s)	
	10/529,896	SAKAI ET AL.	
	Examiner	Art Unit	
	SATISH CHANDRA	1716	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 July 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1, 3 - 16* is/are pending in the application.

4a) Of the above claim(s) *11 - 15* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 3 - 10 and 16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *01 April 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *4/1/05, 12/27/05, 12/8/06, 9/26/07, 10/2/09*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 7/21/2010 has been entered.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 1, 3, 4, 6, 8 – 10 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Toyoda et al (JP 2002-324760) in view of Rossman et al (US 6,121,161), Saito et al (US 2002/0073923) and Kim et al (US 2003/0070617).

Toyoda discloses: regarding claims 1, 8, 10 and 16, a processing apparatus (Figs 1A, 1B, 2A, 2B) comprising an inlet for a plurality of reaction gases such as mono-Silane, SiH4 with mono-Germane GeH4 wherein electrodes 5 (plasma generating device, Fig 1B) including a gas introducing nozzle (not labeled) and a plasma introducing nozzle 7 (hydrogen discharge tube, Fig 2B) for generating hydrogen plasma

is disposed in the space where substrates are processed. Gases are exhausted through an exhaust pipe 18.

Toyoda does not disclose: regarding claims 1, 8 and 16, a cleaning gas supply unit for supplying cleaning gas, a post-processing gas supply unit for supplying post-processing gases, said post-processing gas supply unit includes exclusive supply nozzles for independently supplying each of the reaction gases, said post-processing gases include all reaction gases used when said substrate is subjected to the desired processing; said controller controls said post-processing gas supply unit to supply all of said post- processing gases to said reaction container after the cleaning gas is supplied to said container and before the substrate is placed in the container, and wherein said controller controls the post-processing gas supply unit to supply all of the reaction gases alternately from the exclusive supply nozzles to form multiple layers on reaction container surfaces prior to processing a substrate.

Toyoda does not disclose: regarding claim 3, each of the reaction gases supplied from said post-processing gas supply unit removes the element remaining in said exclusive supply nozzles and said reaction container, and the reaction gases form a desired film in said reaction container.

Rossman discloses: regarding claims 1, 3, 8 and 16, a processing apparatus (Fig 3, Column 9, lines 30 – 64) wherein a precursor layer is deposited in the chamber prior to deposition of the seasoning layer described in FIG. 2. This process is again implemented and controlled using a computer program stored in the memory 33 of CVD system 5. In initial step 300, the chamber is again cleaned as described above (step

200). The chamber is again pressurized to a setpoint of 40 mTorr (step 302). Now, rather than proceeding directly to seasoning the chamber with a protective layer, a precursor layer of silicon oxide (SiO.sub.2) is first introduced into the chamber in step 304. Here, the source generator is set to 4500 W and the bias generator is set to 1600 W. A process gas that includes argon (Ar), oxygen (O.sub.2) and Silane (SiH.sub.4) is introduced into the chamber. Argon is introduced at a rate of 20 sccm, oxygen is introduced at a rate of 140 sccm and Silane is introduced at a rate of 90 sccm. Precursor deposition step 304 is preferably carried out for 30 seconds. After depositing the precursor layer of SiO.sub.2 in the chamber, **a seasoning layer is deposited into the chamber over the precursor layer** (applicant's multiple layers on the chamber walls by supplying gases alternately) in step 306, where the parameters are identical to those described above for FIG. 2 (step 204). **Depositing a precursor layer offers the following advantage: the protective seasoning layer deposited in step 306 adheres more uniformly to the underlying precursor layer than directly to the chamber components. Thus, the protective seasoning layer is less likely to chip and become fragmented when deposited over a precursor layer rather than directly over the chamber components**, improving contamination control. Again, other protective seasoning layers, such as silicon oxynitride (SiON) and phosphorous-doped silicate glass (PSG), for example, may be deposited into the chamber in place of silicon nitride. Following seasoning step 306, substrate processing may be carried out in step 308 until the chamber needs to be cleaned and seasoned again. Applicant please note, it is inherent that each of the reaction gases supplied from said post-processing

gas supply unit removes the element remaining in said exclusive supply nozzles and said reaction container, and the reaction gases form a desired film in said reaction container.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a controller for alternately supplying post-processing gases in the apparatus of Toyoda for forming multiple layers prior to processing a substrate as taught by Rossman.

It would also be obvious to a skilled artisan to supply cleaning gas in the apparatus of Toyoda as taught by Rossman.

The motivation for providing a controller for alternately supplying post-processing gases in the apparatus of Toyoda for forming multiple layers prior to processing a substrate is that the top layer is less likely to chip and rupture when deposited over a first layer (precursor layer) rather than directly over the chamber components as taught by Rossman.

The motivation for supplying cleaning gas in the apparatus of Toyoda is to remove chamber residue from the chamber walls etc. as taught by Rossman.

Toyoda and Rossman do not disclose: regarding claims 1, 8 and 16, post-processing gas supply unit includes exclusive supply nozzles for independently supplying each of the reaction gases.

Saito et al disclose:

Regarding claims 1, 8 and 16, a substrate processing apparatus comprising:

A reaction chamber 11 (Fig 1)

An exhaust port 61 (Para 0099) for exhausting gases from the reaction chamber

A gas supply system 35a, 35b, 35c and 35d for supplying at least a plurality of reaction gases (such as DCS, SiH2Cl2 and ammonia, Para 0093, 0094) to the reaction chamber wherein the gas supply system comprises:

A cleaning gas supply unit, 35d (Para 0097) for supplying cleaning gas (such as HF, Para 0097) to the reaction chamber through the inlets 64a to 64c clean the lower portion and the inner wall of the inner tube 13, and gradually goes upward to clean the upper portion thereof (Para 0151). Post-processing gas supply units (reaction gas supply units) 35a, 35b for supplying post processing gas exclusively through the gas supply pipes (nozzles) 31a, 31b, 31c in the reaction chamber (Para 0093, 0094, 0095 and 0097) wherein each of the reaction gases supplied from the post processing gas supply units remove the element remaining in the exclusive supply nozzles and the reaction chamber and form a desired film in the reaction chamber.

Therefore it would be obvious to a skilled artisan to provide individual nozzles for supplying reaction gases (applicant's post processing gases) in the apparatus of Toyoda and Rossman as taught by Saito.

The motivation for providing individual nozzles for supplying reaction gases (applicant's post processing gases) in the apparatus of Toyoda and Rossman is to optimize their apparatus by providing individual nozzles for supplying all reaction gases separately as taught by Saito.

Toyoda, Rossman and Saito do not disclose: regarding claims 1, 8 and 16, post-processing gas supply unit includes exclusive supply nozzles for independently supplying each of the reaction gases alternately.

Kim et al discloses: regarding claims 1, 8 and 16, an ALD apparatus comprising a valve controller (Para 0011, abstract) for alternately supplying the reaction gases in their processing chamber.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the controller of Toyoda, Rossman and Saito to alternately supply reaction gases (post processing gases) in their apparatus as taught by Kim et al.

The motivation for modifying the controller of Toyoda, Rossman and Saito is to alternately supply reaction gases (post processing gases) in combination with any other gas in their apparatus as taught by Kim et al.

Toyoda discloses: regarding claim 4, supplying a plurality of reaction gases such as mono Silane, SiH4 with mono Germane GeH4. Toyoda further discloses supplying hydrogen activated by plasma generating device (electrodes) 5 in their apparatus.

Toyoda and Rossman do not disclose: regarding claim 4, supplying ammonia gas activated by plasma generating device.

Kim discloses: regarding claim 4, the excited, first reactive gas is either ammonia or hydrogen (Fig 3, Para 0020, 0022).

Therefore it would be obvious to a skilled artisan to provide ammonia gas as excited gas in the apparatus of Toyoda, Rossman and Saito as taught by Kim.

The motivation for providing ammonia gas as excited gas in the apparatus of Toyoda, Rossman and Saito is to provide an alternate and equivalent gas for plasma excitation in their apparatus as taught by Kim.

Regarding claim 6, Toyoda and Rossman do not disclose: the gas including silicon is SiH2Cl2.

Saito discloses regarding claim 6, the gas including silicon is the first gas DCS (SiH2Cl2, Para 0093).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a gas including silicon is SiH2Cl2 in the apparatus of Toyoda and Rossman as taught by Saito.

The motivation for providing a gas including silicon is SiH2Cl2 in the apparatus of Toyoda is to provide a specific gas in the apparatus of Toyoda and Rossman as taught by Saito. It is the intended use of the apparatus and the apparatus of Toyoda, Rossman and Saito is capable of supplying such a gas in their apparatus.

Regarding claim 9, Toyoda and Rossman do not disclose: a heating unit which heats the interior of said reaction container wherein a temperature in the reaction container when the plurality of reaction gases are supplied after the cleaning gas is supplied and before a substrate is processed, is set lower than a temperature in the reaction container when the cleaning is carried out.

Regarding claim 9, Saito et al discloses, a heater 16 (Fig 2, Para 0089) surrounding the circumference of the reaction tube 11. Saito further discloses (Para 0059, 0060 and 0057), during the cleaning process, it is preferred to raise the temperature of the reaction tube,

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a heater surrounding the circumference of the reaction tube to raise the temperature of the reaction chamber during the cleaning process in the apparatus of Toyoda et al and Rossman as taught by Saito et al

The motivation for providing a heater in the apparatus of Toyoda et al and Rossman is to raise the temperature of the reaction chamber during cleaning in their apparatus as taught by Saito

Claims 5 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Toyoda et al (JP 2002-324760) in view of Rossman et al (US 6,121,161), Saito et al (US 2002/0073923) and Kim et al (US 2003/0070617) as applied to claims 1, 3, 4, 6, 8 – 10 and 16 above and further in view of Fukuda et al (US 2005/0139578).

Toyoda, Rossman, Saito and Kim do not disclose:

Regarding claim 5, the cleaning gas is a gas including fluorine is supplied from the exclusive supply nozzle which supplies a gas including silicon.

Regarding claim 7, the gas including is NF3 or ClF3.

Fukuda discloses: regarding claims 5 and 7, in Fig 2, Para 0051, nozzle 22 for supplying a gas containing fluorine (NF3) is tied into the same nozzle which supplies a nitrogen gas via nozzle 5.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide an exclusive nozzle for supplying a nitrogen gas and a gas containing fluorine such as NF3 in the apparatus of Toyoda, Rossman, Saito and Kim as taught by Fukuda.

The motivation for providing an exclusive nozzle for supplying a nitrogen gas and a gas containing fluorine in the apparatus of Toyoda, Rossman, Saito and Kim is to provide a single nozzle for supplying a plurality of gases in their apparatus as taught by Fukuda.

Toyoda, Rossman, Saito, Kim and Fukuda do not disclose: the cleaning gas is a gas including fluorine, is supplied from the exclusive supply nozzle which supplies a gas including silicon.

However, it is the intended use of the apparatus and the apparatus of Toyoda, Rossman, Saito, Kim and Fukuda is capable of supplying a cleaning gas including fluorine is supplied from the exclusive supply nozzle which supplies a gas including silicon.

Response to Arguments

Applicant's arguments with respect to claims 1, 3 – 10 and 16 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SATISH CHANDRA whose telephone number is (571)272-3769. The examiner can normally be reached on 8 a.m. - 4:30 p.m..

If attempts to reach the examiner by telephone are unsuccessful, Primary Examiner, Ram Kackar can be reached on 571-272-1436. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Satish Chandra/
Examiner, Art Unit 1716

/Ram N Kackar/
Primary Examiner, Art Unit 1716